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# The role of radiation diagnostic methods in pathological changes of the hip joint before and after endoprosthetics

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#### **ABSTRACT**

Endoprosthesis replacement-operational treatment of diseases and damages of hip joint. The problem of prevention of complications and their negative effects is extremely actual today. However the role of different beam techniques in identification of adverse effects and complications of endoprosthesis replacement of joints is studied insufficiently. Results of clinic and diagnostic and beam researches of 40 patients with pathology of hip joint are analyzed. The used beam methods of research - roentgenography, multispiral computed tomography. At presurgical stage the main objective was detection of pathology of joint, definition of indications and planning of operative measure. Situation and relationship of components of endoprosthesis, condition of bone tissue, and also bone cement round cup and leg of prosthesis were key parameters of radiological assessment of outcomes of endoprosthesis replacement. Complex use of radiological techniques (roentgenography and spiral computed tomography) allows to specify and add semiotics of changes of bone tissue at the level of acetabular hollow and proximal department of femur after endoprosthesis replacement.

Keywords: Roentgenography, multispiral computed tomography, endoprosthesis, hip joint.

#### **I.Introduction**

In modern traumatology and orthopedics, much attention is paid to the pathology of large joints, which is accompanied by a decrease in the quality of life of patients, their temporary disability and disability. Treatment of severe injuries, acquired or congenital diseases of the hip joint by endoprosthetics allows you to achieve a stable positive rehabilitation effect in a short time and significantly increase the functional capabilities of the interested limb. In parallel with the increase in the number of joint replacement operations, the number of complications is also increasing. The problem of preventing complications and their negative consequences is extremely relevant today. However, the role of various radiation techniques in detecting adverse effects and complications of joint replacement is not well understood.

**Purpose of research-** improvement of radiation diagnostics in the assessment of changes in the hip joint before and after endoprosthetics.

**Material and methods of research.** The results of clinical diagnostic and radiological studies of 40 patients with hip joint pathology were analyzed. The radiographic methods used were radiography and multispiral computed tomography (MSCT). Overview radiography of the hip joints in direct and lateral projections was performed on the BMI model:JOLLY 4S (Italy). During the study, the patient was lying on his back, his lower limbs were stretched out along the table. The examined limb was rotated 10-12° inwards. The focal length is 70 cm. Technical specifications: kV-66, mAs-60.

## 2. Research result.

As you know, endoprosthetics-surgical treatment of diseases and injuries of the hip joint, which at the present stage of development of traumatology and orthopedics is radical and effective. This high-tech method of surgical treatment of hip pathology from a clinical point of view should be considered as a multi-stage process, at each stage of which various diagnostic tasks are solved. The selection of patients in the observation groups was carried out according to certain diagnostic criteria for hip joint pathologies and included: secondary deforming osteoarthritis of the hip joint (50%), primary dysplastic coxarthrosis (5%), femoral neck fracture (36%), aseptic necrosis of the femoral head (5%), false joint of the femoral neck (2%), fractures of the acetabulum and femoral head (2%).

Radiography was performed in all patients. Standard radiography was performed before surgery, in the early postoperative period, and in dynamic follow-up. After surgical treatment, patients underwent radiation examination immediately after the operation and 3 months later. Before planning hip replacement surgery, patients underwent radiography of two hip joints in a direct projection, followed by radiography of the affected hip joint in a direct and axial projection (if the patient did not have a pronounced pain syndrome).

When analyzing radiographs, attention was paid to the study of quantitative and qualitative features: the shape and relationship of the articular ends of bones, their surface, the presence of marginal bone growths, and the structure of bone tissue. The acetabulum, the shape of the head, neck, upper, outer and inner contours of the femur were evaluated in a direct projection.

At the preoperative stage, the main task was to identify pathology of the joint determination of indications and planning of surgical intervention. During the study, the nature of the detected pathological changes and their prevalence were determined. MSCT was performed in 13 patients. At the final stage, MSCT results were compared with clinical data and digital radiography results. The data obtained were analyzed, as well as the diagnostic effectiveness of

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radiography and MSCT was evaluated.

X-rays and computer tomograms were used to determine the size of the proximal femur and acetabulum. Quantitative and qualitative features were studied on radiographs of the hip joint in 2 projections, as well as on computer tomograms: the shape and relationship of the articular ends of the bones, their surface, and the structure of bone tissue. In the direct projection, the computed tomogram repeated the x-ray examination and did not carry any additional diagnostic information. A special feature of this method was the possibility of layer-by-layer scanning in the horizontal plane of all tissues that fall into the section. When evaluating the upper parts of the femoral heads and the most loaded part of the acetabulum, multi-plane and PO reconstruction of the image was used.

Radiologically deforming osteoarthritis of the hip joint stage III, detected in 20 patients, was characterized by sharp changes in all elements of the joint. The articular gap was significantly narrowed, in some places could not be traced or was difficult to determine. There were pronounced bone growths up to  $3.3\pm2.1$  mm in size along the edges of the femoral head and acetabulum. The acetabular cartilage lip was 100% calcified. MSCT made it possible to detail the nature and prevalence of structural changes, and to assess the relationship of joint ends. Thin computer sections revealed small cyst-like clearings (1-2 mm in size) in the supra-acetabular region, as well as small areas of sclerosis that were not visualized on x-rays.

After surgery radiographically assessed the quality of technical performance of the implantation, the spatial position of the implant in the tissues, we evaluated the change in bone tissue structure based on the data of previous x-ray studies revealed postoperative complications. The main parameters of x-ray evaluation of endoprosthesis outcomes were the position and relationship of the endoprosthesis components, the state of bone tissue, and bone cement around the Cup and leg of the prosthesis. After endoprosthetics, the interaction of the implant with the bone tissue begins, which can be considered as a dynamic process that accompanies the patient throughout life, when there are significant changes associated with new biomechanical conditions, structural restructuring of the bone and surrounding soft tissues. Changes in the contralateral joint were visualized. Interpretation of the data obtained was limited in assessing the state of the endoprosthesis and adjacent bone structures due to the presence of many artifacts from metal structures.

According to MSCT data, the condition of paraarticular soft tissues was additionally evaluated. Indications for MSCT after endoprosthesis were: pain in the area of the operated joint; paraprosthetic fracture of the femur; aseptic instability of the endoprosthesis components.

MSCT examination revealed artifacts around the metal Cup, head, and leg of the endoprosthesis. MSCT above the upper contour of the metal parts of the prosthesis provided visualization of bone tissue with all the existing changes. Artifacts were absent around the plastic Cup, and also did not extend to the collateral joint, which provided sufficient assessment of it. In the early postoperative period, radiography revealed such complications as periprosthetic fractures in 1 patient, dislocations of the prosthetic head from the Cup in 2 patients, which is consistent with the literature data. Signs of these complications were reliably diagnosed using standard radiography. However, publications have identified another large group of complications, including aseptic instability of the endoprosthesis components, post-traumatic osteomyelitis, hematomas, and heterotopic ossification, which were difficult to detect by x-ray results. Taking this into account, a comprehensive approach should be applied in the selection of methods of radiation diagnostics.

As you can see, radiography and MSCT are x-ray research methods that are not equal in their diagnostic information content, radiation load, and cost. The diagnostic efficiency of spiral computed tomography exceeds the diagnostic efficiency of radiography in the diagnosis of hip joint pathology during endoprosthetics. Changes in the contralateral joint were visualized. Interpretation of the data obtained was limited in assessing the state of the endoprosthesis and adjacent bone structures due to the presence of many artifacts from metal structures.

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## 3. Conclusions.

Thus, it is necessary to improve the system approach in choosing the method of radiation diagnostics for earlier and more accurate diagnosis of complications after endoprosthesis of large joints. The complex use of radiological techniques (radiography and spiral computed tomography) allows us to clarify and Supplement the semiotics of changes in bone tissue at the level of the acetabulum and the femoral proxy after endoprosthesis.

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